SECTION 4
PIPE, FITTINGS, VALVES, AND APPURTENANCES

4.1 GENERAL

4.2 PIPE AND FITTINGS

- 4.21 General
- 4.22 Cast and Ductile Iron
- 4.23 Polyvinyl Chloride (PVC)
- 4.24 HDPE Pipe & Tubing
- 4.25 Polyethylene Plastic Tubing
- 4.26 Copper Pipe and Tubing
- 4.27 Special Items

4.3 VALVES

- 4.31 General
- 4.32 Backflow Devices
- 4.33 Check Valves
- 4.34 Plug Valves (PV)
- 4.35 Butterfly Valves
- 4.36 Valve Boxes
- 4.37 Meter Boxes
- 4.38 Fire Hydrants
- 4.39 Service Lines
- 4.40 Water Meters

4.4 INSTALLATION

- 4.41 General Requirements

SECTION 4
PIPE, FITTINGS, VALVES, AND APPURTENANCES

4.1 GENERAL

A) This section includes the material and installation standards for pipe, fittings, valves, and appurtenances, as applicable to water, sewer and reuse installations.

B) Required specialty items not included under this Section shall be high quality and consistent with approved standards of the industry for the applicable service installation, and shall be approved by the City prior to installation.

C) All material is to be furnished by the contractor or developer, with the exception of meters and meter couplings.

4.2 PIPE AND FITTINGS

4.21 General

All pipe and fittings shall be clearly marked with the name or trademark of the manufacturer. All pipe and fittings shall be suitable for 150 p.s.i. working pressure and shall meet all applicable AWWA specifications. All pipe installations shall have indicator tape run with pipe to indicate the purpose of piping (water, sewer, force main) and copper tracing wire for location purposes.

No 3" pipe shall be allowed for use in the City's utility systems.

4.22 Ductile Iron

A) Ductile iron pipe shall be in accordance with ANSI/AWWA C151/A21.51. Pipe shall be laid in accordance with ANSI/AWWA C150/A21.50. Thickness class shall be governed by design conditions, minimum pressure class shall be 350.

B) Cast and ductile iron pipe fittings shall conform to ANSI/AWWA C110/A21.10 and ANSI/AWWA C153/A21.53. All underground fittings shall be mechanical joint, unless otherwise specified.

C) Joints

1) "Push-On" and mechanical type joints shall be in accordance with ANSI/AWWA C111/A21.11.

2) Restrained joint assemblies with mechanical joint pipe shall be Mechanical Joint Retainer Glands, "locked-type" joints of EBBA Megalug Series 1100 or approved equal.

3) Flanged connections shall be in accordance with ANSI/AWWA C115/A21.15, 125 lb. standard.

4) No leaded joints or connection of any kind will be permitted.

5) PVC fittings for pressure mains are prohibited above 2 inches in diameter,

unless otherwise specifically approved by the City.

D) Coatings and Linings

1) Ductile iron pipe and fittings for force mains or when used as gravity sewer service shall receive an interior epoxy lining for both pipe and fittings in accordance with AWWA C210.

2) Ductile iron pipe and fittings for water and reuse service shall be cement mortar lined in accordance with ANSI/AWWA C104/A21.4.

3) Ductile iron pipe and fittings for water, sewer and reuse shall receive an exterior asphaltic coating approximately 1 mil thick. The coating shall be applied to the exterior of all pipe and fittings unless otherwise specified. Coatings shall be applied in accordance with AWWA C110 & C153-fittings, AWWA C115-flanged pipe, and AWWA C151-ductile iron pipe.

4.23 Polyvinyl Chloride (PVC)

A) Pipe shall be manufactured from clean virgin Type I, Grade I rigid, unplasticized polyvinyl chloride resin (Class 12454-A or Class 12454-B) conforming to ASTM D1784. The PVC compound shall have an established hydrostatic design basis (HDB) of 4000 psi as described in ASTM D2837. The pipe shall bear the National Sanitation Foundation (NSF) seal for potable water pipe. Pipe with diameters less than 4" shall be Class 200 with a minimum Standard Dimension Ration (SDR) of 21 and shall be in accordance with ASTM D-2241.

Pipe with diameters of 4" to 12" for water mains shall have a minimum dimension ratio (DR) of 18, Class 150, and shall be manufactured in accordance with AWWA Specifications C-900 latest revision. Pipe with diameters of 14" and larger for water mains shall have a minimum dimension ratio (DR) of 25, Class 165, and shall be manufactured in accordance with AWWA Specification C-905 latest revision or Pressure Class 350 ductile iron pipe (per Section 4.22) may be used. Pipe with diameters of 4" to 12" for sewer force mains shall have a minimum dimension ratio (DR) of 25, Class 100, and shall be manufactured in accordance with AWWA Specification C-900 latest revision. Pipe with diameters of 14" and larger for sewer force mains shall have a minimum dimension ratio (DR) 25, Class 165, and shall be manufactured in accordance with AWWA Specification C-905 latest revision or Pressure Class 350 ductile iron pipe (per Section 4.22 may be used). Sanitary gravity sewer pipe shall have a minimum standard dimensional ratio (SDR) of 35, for installations up to 13 feet in depth, and shall be manufactured in accordance with ASTM D3034. Sanitary gravity sewer pipe shall have a minimum standard dimensional ratio (SDR) of 26 for installations deeper than 13'.

PVC Pipe Restrainers shall be EBBA Megalug Series 2000, or approved equal.

PVC PIPE COLORS

WATER - Blue
SEWER - Green (Force main); Green (Gravity Sewer)
REUSE - Purple

B) Connections and fittings for pipe 1 ½" and smaller shall be solvent welded sleeve type joint. Connections and fittings for pipe 2" and 2 ½" in diameter shall be rubber

compression ring type. Pipe shall be extruded with integral thickened wall bells without increase in DR. Rubber ring gaskets shall consist of synthetic compounds meeting the requirements of ASTM Designation D1869, and suitable for the designated service. Fittings for Pressure mains 3" and larger (water lines or, sewage force mains) shall be ductile iron with mechanical joint rubber compression ring type joints.

C) All piping (PVC, Polyethylene tubing) shall have a type TWH insulated PVC copper conductor, #14 solid strand wire that is strapped to the pipe at ten-foot intervals.

4.24 High Density Polyethylene (HDPE) Pipe and Tubing

Pipe and tubing shall comply with AWWA C906, AWWA C800 and AWWA C901, and be certified for potable water service by the National Sanitation Foundation.

A) Materials

i) Pipe and Fittings:

The pipe supplied under this specification shall be high performance, high molecular weight, high density polyethylene pipe, PE 3408. The pipe shall conform to ASTM D 1248 (Type III C, Class C Category 6\5, P.O. 3408). Minimum cell classification values shall be 345434C as referenced in ASTM D 3350 - latest edition. The fittings supplied in this specification shall be molded or manufactured from a polyethylene compound having a cell classification equal to or exceeding the compound used in the pipe. Fitting connections shall be made with flange adaptors utilizing 316 stainless steel back up rings and 316 stainless steel hardware. A separate ½" Schedule 40 PVC conduit shall be installed on the top side of the HDPE directional bore containing 14 Gauge tracing wire. All HDPE directional bores larger than 2" in diameter shall have fusion welded fittings and ends for connection.

ii) Tubing and Fittings:

The tubing supplied under this specification shall be high performance, high molecular weight, high density polyethylene tubing, PE 3408. The pipe shall conform to ASTM D 1248 (Type III, Grade P34, Class A, Category 5). Minimum cell classification values shall be 345434E as referenced in ASTM D 3350 - latest edition. The **tubing shall be blue** as manufactured by Endot Industries or a Department of Environmental Services approved equal. The fittings shall be brass, equipped with compression type connections.

iii) Quality Control:

A) The pipe and tubing shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. The pipe shall be homogenous throughout and free of visible cracks, holes, foreign inclusions, or other deleterious defects, and shall be identical in color, density melt index, and other physical properties.

The engineer may request certification that the pipe produced is

represented by the quality assurance data. Additionally, test results from manufacturer's testing which shows the pipe does not meet appropriate ASTM standards or manufacturer's representation, can be cause for rejection. These tests may include density and flow rate measurements from samples taken at selected locations within the pipe wall and thermal stability determinations according to ASTM, D 3350, 10.1.9.

B) The owner or the specifying engineer may request certified lab data from the manufacturer to verify the physical properties of the materials supplied under this specification or at his own expense may take random samples for testing by an independent laboratory.

C) Polyethylene pipe, tubing and fittings may be rejected for failure to meet any of the requirements of these specifications.

iv) Material Dimensions:

A) Pipe for sizes 4" and larger supplied under this specification shall have a nominal IPS (iron pipe size) O.D. and shall be rated for a minimum working pressure of 160 psi with a minimum Standard Dimension Ratio (SDR) of 11 for force and water main pipes.

v) Construction Practices:

A) Trench Construction:

The trench and trench bottom shall be constructed in accordance with ASTM Standard D 2321-Section 7.

B) Embedment Material:

Embedment materials shall be Class I, Class II, or Class III materials as defined by ASTM D 2321-Section 6. The use of Class IV and Class V materials for embedment is not recommended and shall be done only with the approval of the engineer.

C) Bedding:

Bedding of the pipe shall be performed in accordance with ASTM Standard 2321-Section 8. Compaction rates shall be as specified in ASTM D 2321. Deviations from the specified compaction must have the approval of the engineer.

D) Haunching and Initial Backfill:

Haunching and initial backfill should be as specified in ASTM D 2321-Section 9 using Class I, Class II, or Class III materials. Materials used and compaction rates shall be as specified by the engineer. In cases where a compaction rate of 85% Standard Proctor Density is not attainable, the engineer may wish to increase the SDR of the pipe to provide adequate stiffness.

E) Special Conditions:

ASTM D 2321-Section 11.2, minimum cover for load applications, section 11.3, use of compaction equipment and section 11.4, removal of trench protection should apply unless directed otherwise by the engineer.

F) After polyethylene piping is installed and backfilled, the contractor shall apply an initial hydrostatic pressure to the pressure listed in the piping schedule shown on the drawings. The initial test pressure shall be allowed to stand without make-up pressure for a period of time as required by the pipe manufacturer and approved by the engineer to allow for diameter expansion or pipe stretching to stabilize. After the required equilibrium period the test section shall be returned to the original test pressure.

G) HDPE Pressure Testing Procedures:

The initial pressure test can be conducted before the line is backfilled. However, it is advisable to cover the pipe at intervals or particularly at curves to hold the pipe in place during pressure test. Flanged connections may be left exposed for visual leak inspection. **The main shall be tested after the final installation is completed.**

Test pressure should not exceed 1.5 times the rated operating pressure of the pipe or the lowest rated component in the system.

The initial pressure test shall be applied and allowed to stand without make up pressure for a sufficient time to allow for diametric expansion or pipe stretching to stabilize. This usually occurs within 2 to 3 hours. After this equilibrium period, the test section can be returned to the 1.5 times operating pressure, the pump turned off, and a final test pressure held for 2 hours.

Allowable amounts of make up water for expansion during pressure test is shown in Chart 6, taken from PPI technical report TR 31/9-79. There shall be no visual leaks or pressure drops greater than 5 p.s.i. during the final test period.

Under no circumstances shall the total time under test exceed 3 hours at 1 ½ times the pressure rating. If the test is not completed because of leakage, equipment failure, or other reason, the test section shall be permitted to 'relax' for 8 hours before the next testing sequence.

4.25 Polyethylene Plastic Tubing - 2" and less

Tubing shall comply with AWWA C800 and AWWA C901, be approved for potable water service by the National Sanitation Foundation and bear the NSF seal. Tubing shall be Endot "Endopure" CTS OD tubing, or Driscolite PE 3408, SDR9, 200 psi, Type III, Grade P-34, Class C, blue in color. The product shall be rated for a minimum working pressure of 200 psi with a minimum Standard Dimension Ratio (SDR) of 9. Fittings shall be brass, equipped with compression type connections.

4.26 Copper Pipe and Tubing

Pipe or tubing shall meet AWWA C-800. Fittings shall be brass, with approved compression connections.

4.27 Special Items

A) Tapping Saddles

Any tap or valve installation into the existing City system shall be made by the City or approved agent at the expense of the Developer. The cost for taps shall be set by the City of Leesburg Water Department at current prices at the time of the tap.

B) Service Saddles

Shall be Ford #F202 Series, double strap with IP outlet, or City approved equal. Sealing gasket shall be BUNA-N rubber and straps shall be steel.

4.3 VALVES

4.31 General

The valve type, size, rating, flow direction arrow if applicable, and manufacturer shall be clearly marked on each unit. Valves shall open left (counterclockwise) with an arrow cast in the metal of operation handwheels and nuts indicating the direction of opening. Valves shall be located on each leg of every tee and cross.

A) Valves for Underground Service

Valves from 2" thru 12" for underground service shall be iron body gate valves, non-rising stem type and shall be equipped with a 2" square cast iron operating nut with corrosion protection coating inside and out. Resilient seated valve which meets all C-509 requirements of AWWA (water). Acceptable manufacturers are Mueller A2370-20, American Darling CRS-80 or equivalent Kennedy or Clow models. All dead end lines will have valves at the end equal to the size of main line with blow off attached. End line valves shall be adequately restrained to the pipeline such that they may be excavated and the line extended without shutting off line pressure.

Tapping valves shall be resilient seat gate valves as manufactured by either Mueller or American.

B) Valves for Above-Ground Service for Water Systems Only

Valves shall be flanged iron body, bronze mounted resilient seat gate valves, conforming to AWWA C-509, with the exception that valves shall be outside screw and yoke (OS & Y) rising stem type. Valves shall have cast iron hand wheels or chain operators with galvanized steel chains, as required. Valves for fire suppression system shall be approved by City fire officials and a detector valve may be required.

C) Valves Smaller than 2 Inches

Valves smaller than 2 inches shall be bronze body gate valve conforming to Federal specifications 150 psi minimum working pressure with threaded joints equal to

American 3 FG or City approved equal.

4.32 Backflow Devices

A) All services are to be protected by a backflow prevention device suited to the highest degree of hazard encountered at the connection. Maintenance of the device is to remain the responsibility of the Utility customer, including proper certifications.

B) Double check valve assembly shall be designed to specification of the USC Cross Connection Control Laboratory, and A.S.S.E. #1015.

Double check valves shall be Febco 805-Y-BV for 3/4" thru 2" and Febco 805-YD for 2 ½" thru 10", Watts #709 Series 3/4" thru 10". Double check valve assembly from 2 ½" and up shall be furnished with OS & Y gate valve shut-offs.

C) All commercial services shall be equipped with a reduced pressure zone backflow prevention device. Reduced pressure zone valve shall be designed to specification of the USC Cross Connection Control Laboratory, and A.S.S.E. #1015. Reduced pressure zone valve shall be Febco 825-Y-BV for sizes 3/4" thru 2" and Febco 825-YD for sizes 2 ½" thru 10", Watts Series 909 for sizes 3/4" thru 10". Reduced pressure zone valve assembly from 2 ½" and up shall be furnished with OS&Y gate valve shut-offs.

D) Pressure vacuum breaker shall be designed to specification of USC Cross Connection Control Laboratory, A.S.S.E. #1020. Spring loaded single float and disc with independent water inlet and air inlet valves. Furnished with shut-off valves and ball type test cocks. Pressure vacuum breaker shall be Watts #800 or Febco #765.

E) Shut-off valves on backflow assembly for sizes 3/4 inch through 2 inches shall be provided with ball valves, assemblies above 2 inch shall be provided with resilient seat full flow gate valves.

F) Where reuse water is available, all potable water connections shall be equipped with a reduced pressure zone backflow prevention device.

G) All backflow prevention devices shall be set within 12" of the meter and shall be set a minimum of 12" above the 100 year flood plain.

H) Fire sprinkler systems to have a Double Detector check valve assembly (D.D.C.)

4.33 Check Valves

Valves for wastewater application shall be iron body, bronze mounted stainless steel hinge pin, outside lever and spring operated, swing type, and equipped with removable inspection covers. Units shall be rated for 150 psi minimum working pressure and shall permit full flow area equal to that of the connecting pipe. Mueller #2600-6-02, American Darling #52SC, or Kennedy or M & H equivalents.

4.34 Plug Valves

Valves for wastewater application shall be epoxy lined, semi-steel body, non-lubricated, eccentric type plug valves, with resilient faced plugs, and capable of drip-tight shut -off at the rated pressure if applied at either port. Operation of all valves 8" or larger, and smaller

sizes in exposed locations which require handwheels or chainwheels, shall be by approved gear actuators, equipped with position indicator and stop, and shall be furnished by the valve manufacturer. Gear actuators for buried or submerged installations shall be furnished with sealed enclosures. Valves shall be equipped with actuating nuts, cast iron handwheels or chain operators, with galvanized steel chains, as appropriate for the installation and type of operator. Valves and appurtenances shall be Series 100, as manufactured by DeZurik Corp., Clow or approved equal.

4.35 Butterfly Valves

Valves larger than 12" shall be cast iron body, self-lubricated, resilient seated, one-piece stainless steel shaft, and capable of drip-tight shut-off at the rated pressure and meet AWWA C504. Valve operators shall conform to AWWA C504. Valve operator for buried or submerged installations shall be furnished with sealed enclosures. Valves shall be equipped with actuating nuts, cast iron handwheels or chain operator as appropriate for the installation and type of operator. Valves shall be installed in a vertical position. Valves and appurtenances shall be DeZurik Series 130, American-Darling 150 or Pratt. All valves shall be accompanied by a 3-inch diameter bronze valve marker anchored in the concrete pad which indicates size of valve, type of valve, service (water, sewer, etc...) and direction and number of turns to open.

4.36 Valve Boxes

Units shall be adjustable, cast iron, minimum interior diameter of 5", with covers cast with the applicable inscription in legible lettering on the top; "SEWER", “REUSE” or “WATER”. Boxes shall be suitable for the applicable surface loading and valve size. Valve boxes not in the pavement shall have around their tops concrete pads, which will be flush with the top of the curb, with minimum dimensions of 24" x 24" x 4" and rebar as per attached details. Valve boxes located in the pavement shall have around their tops concrete pads, which will be flush with the top of the pavement, with minimum dimensions of 24" x 24" x 6" and rebar as per attached details. All valves shall be accompanied by a 3" diameter bronze valve marker anchored in the concrete pad which indicates size of valve, type of valve, service (water, reuse, sewer, etc...) and direction and number of turns to open.

4.37 Meter Boxes

Plastic meter boxes shall be Brooks Catalog #1419 with overlap lid, plastic with metal meter reader, or approved equal.

4.38 Fire Hydrants

A) Fire hydrants shall be of Mueller Super Centurian 200 oil reservoir, American Darling 6" B-84-B, 5-1/4" Clow Medallion UL/FM, or Kennedy KD1-D.

B) A blue roadway reflector shall be required to be installed with each fire hydrant.

4.39 Service lines

Service lines shall be 1" for single and 2" with 1" branch off for double service. All fittings shall be Mueller, McDonald or Ford brass. One inch (1") corporation stops shall be Ford FB1100, McDonald 4704B-22,or Mueller 25028. Two inch (2") corporation stops shall be (MIP x MIP) Ford FB500 or McDonald 3131B. Curb Stops (lock wing), shall be in accordance with the table below:

Size	Type	Ford	McDonald	Mueller
3/4"	FIP x FIP	B11-233W	6101W	B20200 R
3/4"	Comp x FIP	B41-233W	6102W-22	B25170 R
3/4"	FIP x SPUD	B13-232W	6101MW	B24351 R
3/4"	Comp x SPUD	BR43-232W	6100MW-22	B24350 R
1"	FIP x FIP	B11-344W	6101W	B20200 R
1"	Comp. X FIP	B41-344W	6102W-22	B25170 R
1"	FIP x SPUD	B13-344W	6101MW	B24351 R
1"	Comp. X SPUD	B43-344W	6100MW-22	B24350 R

Note: Service layout must be approved by the City.

4.40 Water Meters

All meters shall be supplied by the City at the expense of the utility customer, up to 2". All meters larger than 2" shall be purchased by the City and billed to the utility customer.

4.4 INSTALLATION

4.41 General Requirements

A) Piping, fittings, valves and appurtenances shall be installed in accordance with these Standards and/or approved by the City of Leesburg Environmental Services Department.

B) Piping shall be installed along straight line and grade between fittings, manholes, or other defined points, unless definite lines of alignment, deflection or grade change have been established. Modification to approved alignment or grade during construction shall receive prior approval from the City and all resulting design considerations shall be resolved by the contractor.

C) Materials shall be cleaned and maintained clean, with all coatings protected from damage. The interior of the pipe shall be free of dirt and debris, and when work is not in progress, all open ends shall be plugged.

D) Pipe, valves, fittings, or other items shall be inspected prior to installation, and any items showing a fracture or other defect shall be rejected. However, ductile iron pipe showing an end crack, with no fracture indicated beyond that visible, may be salvaged by cutting off the damaged section 12" past the crack, providing the remaining pipe is sound.

E) Underground piping shall not be driven to grade by striking it with an unyielding object. when the pipe has been properly bedded, enough compacted backfill shall be placed to hold the pipe in correct alignment. If necessary, precaution should be taken to prevent flotation.

F) Jointing shall be by an approved method and shall not require undue force to

accomplish full satisfactory seating and assembly. Connections at structures shall be cut accurately and worked into place without forcing and shall align with the connecting point.

G) “Mega-Lug restrained joints shall be provided at all bends, wyes, tees, caps, valves, hydrants and reducers. If any joints are within the required restrained length they shall be restrained with a restraining harness as required. The restraints will be sized and placed according to the plans or according to the pipe manufacturer’s recommendations when not shown on the plans, and approved by the City.

H) Subaqueous pipe laying may be permitted where conditions make it impractical to lay pipe in the "dry", provided the contractor submits his plans for laying pipe under water to the City and obtains advance approval thereof.

I) Ductile iron pipe is required at all street crossings, ditch crossings, culvert crossings, bore and jack crossings, or stormwater or sewer crossings, with the exception of directional bores, which shall be minimum SDR-11 HDPE.

J) Disinfecting of all potable water pipes shall be accomplished by the contractor following approved pressure testing. Unless alternate procedures are set forth under the applicable service Standard, said disinfecting procedures shall be in accordance with AWWA Standard C651.

K) Ductile Iron Pipe installation shall be performed in accordance with the applicable provisions of the latest AWWA Specifications.

L) Polyvinyl Chloride (PVC) pipe-lubrication and/or solvent for pipe and fitting Joints shall be non-toxic (NSF approved for potable water). Following making, solvent type joints shall not be disturbed for 5 minutes and shall not have internal pressure applied for 24 hours, or as recommended by the pipe manufacturer.

(Reserved)